

Remarks

Entry of this amendment and allowance of all claims are respectfully requested. Claims 1-30 remain pending.

Initially, Applicants gratefully acknowledge the indication of allowability of claims 7, 8 and 19 if rewritten in independent form including all the limitations of the base claim and any intervening claims. In response, claims 7 and 19 are rewritten herein into independent form, substantially including all the limitations of the base claim and any intervening claims. The indicated patentable subject matter of claims 7 & 19 is believed to remain with the rewritten independent claims 7 and 19, which state that at least some fins within the inner chamber of the thermal spreader have different lengths within the chamber. Allowance of these claims (as well as claim 8 which depends from claim 7) is therefore respectfully requested.

By this amendment, independent claims 1, 14, 22 & 28 are amended to recite that the inner chamber of the thermal spreader also includes a vapor expansion section, that the vapor expansion section and the phase separator allow vapor liquid to circulate between the boiling section and the condensing section, that the heat extraction assembly is disposed at least partially within the vapor expansion section and within the condensing section, and that the heat extraction assembly extracts heat from the vapor expansion section to facilitate condensing of vapor within the inner chamber to liquid, and extracts heat from liquid within the condensing section to further cool the liquid before the liquid circulates to the boiling section. Support for the amended claims can be found in FIG. 2B of the application as filed, as well as the supporting specification discussion thereof. No new matter is thus added to the application by any amendment presented.

Substantively, prior claims 1-6, 12-18, 21-28 & 30 were rejected under 35 U.S.C. §102(b) as being anticipated by Paterson (U.S. Patent No. 5,390,077), while claims 9-11, 20 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Paterson in view of Sugito (U.S. Patent No. 6,681,843). These rejections are respectfully traversed to any extent deemed applicable to the amended independent claims presented herewith, and reconsideration thereof is requested.

In one aspect, Applicants' invention (e.g., claim 1), is directed to a cooling system which includes a thermal spreader having an inner chamber at least partially filled with a liquid, and a phase separator disposed within the thermal spreader. The phase separator at least partially divides the inner chamber into a boiling section and a condensing section, and the inner chamber further includes a vapor expansion section, wherein the phase separator and the vapor expansion section allow vapor and liquid to circulate between the boiling section and the condensing section. A heat extraction assembly is also provided and is disposed at least partially within the vapor expansion section and within the condensing section of the inner chamber. The heat extraction assembly extracts heat from the vapor expansion section to facilitate condensing a vapor within the inner chamber to liquid and extracts heat from liquid within the condensing section to further cool the liquid before the liquid circulates to the boiling section. When the thermal spreader of the cooling system is coupled to a heat generating component with the boiling section thereof disposed adjacent to the heat generating component, liquid within the thermal spreader boils in the boiling section, producing vapor which leaves the boiling section and causes liquid to flow into the boiling section from the condensing section, thereby providing circulatory vapor and liquid flow between the boiling section and the condensing section and facilitating removal of heat from the heat generating component.

With respect to an anticipation rejection, it is well settled that there is no anticipation of a claim unless a single prior art reference discloses: (1) all the same elements of the claimed invention; (2) found in the same situation as the claimed invention; (3) united in the same way as the claimed invention; and (4) in order to perform the identical function as the claimed invention. In this instance, Paterson fails to disclose various aspects of Applicants' invention as recited in the amended independent claims presented, and as a result, does not anticipate (or even render obvious) Applicants' invention.

Paterson discloses an apparatus for cooling an integrated circuit device which includes a container defining a chamber that is partially filled with a coolant which forms a coolant pool in a lower portion of the chamber. Heat generated by the integrated circuit causes boiling of the coolant at a heating area of the coolant pool so that vaporized coolant rises upward from the coolant pool and condenses on a ceiling of the chamber forming coolant droplets thereon. A baffle is positioned within the inner chamber and is configured to guide coolant droplets away

from the heating area of the coolant pool as the coolant droplets fall from the ceiling towards the coolant pool due to gravity. (See Abstract.)

Initially, Applicants respectfully submit that Paterson does not teach or suggest their recited structure wherein a heat extraction assembly is disposed at least partially within a vapor expansion section and within a condensing section of the inner chamber as the two sections are defined within the present application. In the vapor expansion section, the heat extraction assembly extracts heat to facilitate condensing of vapor within the inner chamber to liquid, and within the condensing section, the heat extraction assembly operates to further cool the condensed liquid before the liquid circulates back to the boiling section. By further cooling the liquid in the condensing section using the heat extraction assembly, Applicants deliver a lower temperature liquid back to the boiling section, thereby allowing for a greater amount of heat extraction from the heat generating component as the liquid within the thermal spreader is brought to a boiling temperature within the boiling section.

Paterson depicts and describes fins 48 extending into the inner chamber in the vapor expansion section of the chamber, but does not disclose the existence of any heat extraction assembly disposed within a condensing section where the heat extraction assembly extracts heat from liquid within the condensing section to further cool the liquid before the liquid circulates to the boiling section. Paterson does not teach or suggest the disposition of a heat extraction assembly within liquid disposed within a condensing section as the condensing section is defined in the structure of Applicants' recited invention.

For the above reasons, Applicants respectfully submit that the independent claims presented herewith patentably distinguish over Paterson.

Sugito is cited in the Office Action for allegedly teaching the use of a phase change working fluid cooling device wherein the device is operated in an almost upright position. A careful reading of Sugito fails to uncover any teaching or suggestion of a heat extraction assembly being disposed at least partially within the inner chamber of the phase separator, let alone within both a vapor expansion section and a condensing section of the inner chamber to extract heat from both the vapor and from the liquid as recited by Applicants in the independent claims presented herewith.

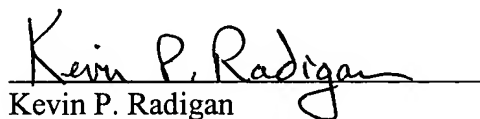
Thus, Applicants respectfully submit that independent claims 1, 14, 22 & 28 patentably distinguish over Paterson and Sugito, either alone or in combination.

The dependent claims are believed allowable for the same reasons as their respective independent claims, as well as for their own additional characterizations. For example, claims 13 & 21 further recite that pressure within the inner chamber is lower than atmospheric pressure surrounding the cooling system. A careful reading of Paterson and Sugito fails to uncover any teaching or suggestion of such a concept.

All pending claims are believed to be in condition for allowance, and such action is respectfully requested.

Applicants' undersigned attorney is available should the Examiner wish to discuss this application further.

Respectfully submitted,


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